

Claims

What is claimed is:

1. A fluid control system comprising:
at least one double-acting cylinder;
at least one fluid-driven motor;
a pressurized fluid source configured to supply pressurized fluid flow to the at least one double-acting cylinder and the at least one fluid-driven motor;
a tank configured to receive return fluid flow from the at least one double-acting cylinder and the at least one fluid-driven motor;
a back pressure element disposed between the tank and the motor, the back pressure element being configured to influence a fluid backpressure condition on fluid discharged from the motor; and
a dedicated flow line configured to provide make-up fluid to the motor at a location between the motor and the back pressure element.
2. The system of claim 1, further including a combination main-relief and by-pass valve, the pressurized fluid source being configured to provide fluid across the combination main relief and by-pass valve and to the dedicated flow line.
3. The system of claim 1, further including a pilot pump and a pilot relief valve, the pilot pump being configured to provide fluid across the pilot relief valve and to the dedicated flow line.

4. The system of claim 3, further including a motor return line configured to provide fluid communication between the at least one fluid-driven motor and the tank, the back pressure element being associated with the motor return line, and the dedicated flow line being configured to provide make-up fluid to the motor return line upstream of the back pressure element.

5. The system of claim 4, further including a cylinder return line configured to provide fluid communication between the at least one double-acting cylinder and the tank without passing across the back pressure element.

6. The system of claim 5, further including:
a combination main-relief and by-pass valve;
a pilot pump;
a pilot relief valve; and
a second dedicated flow line configured to provide make-up fluid to the at least one fluid-driven motor at a location between the motor and the back pressure element,

wherein the pressurized fluid source is configured to provide fluid across the combination main-relief and by-pass valve and to the dedicated flow line, and wherein the pilot pump is configured to provide fluid across the pilot relief valve and to the second dedicated flow line, the motor return line being configured to receive fluid from at least one of the dedicated flow line and the second dedicated flow line.

7. The system of claim 5, further including:
a plurality of double-acting cylinders; and
a plurality of fluid-driven motors, the cylinder return line being configured to provide fluid communication from the plurality of double-acting cylinders to the tank and the motor return line being configured to provide fluid communication from the plurality of fluid-driven motors to the tank.

8. The system of claim 7, further including:
a combination main-relief and by-pass valve;
a pilot pump;
a pilot relief valve; and
a second dedicated flow line configured to provide make-up fluid to the plurality of fluid-driven motors at a location between the motors and the back pressure element,
wherein the pressurized fluid source is configured to provide fluid across the combination main-relief and by-pass valve and to the dedicated flow line, and wherein the pilot pump is configured to provide fluid across the pilot relief valve and to the second dedicated flow line, the motor return line being configured to receive fluid from at least one of the dedicated flow line and the second dedicated flow line.

9. The system of claim 7, wherein at least one of the double-acting cylinders includes a hydraulic cylinder and at least one of the fluid-driven motors includes a reversible, hydraulic motor.

10. The system of claim 7, further including:
a plurality of flow control valve arrangements, each of the plurality of flow control valve arrangements being associated with and being configured to control pressurized fluid flow to one of the plurality of double-acting cylinders.

11. The system of claim 10, further including:
a combination main-relief and by-pass valve;
a pilot pump;
a pilot relief valve; and
a second dedicated flow line configured to provide make-up fluid to the plurality of fluid-driven motors at a location between the motors and the back pressure element,

wherein the pressurized fluid source is configured to provide fluid across the combination main-relief and by-pass valve and to the dedicated flow line, and wherein the pilot pump is configured to provide fluid across the pilot relief valve and to the second dedicated flow line, the motor return line being configured to receive fluid from at least one of the dedicated flow line and the second dedicated flow line.

12. The system of claim 10, wherein each of the plurality of flow control valve arrangements includes four metering valves.

13. The system of claim 12, wherein the four metering valves include a pair of meter-in valves and a pair of meter-out valves.

14. The system of claim 10, wherein at least one of the plurality of flow control valve arrangements includes an independent metering valve.

15. A method for controlling a hydraulic circuit, comprising:
supplying fluid to at least one motor and to at least one cylinder from a pressurized supply;
directing fluid away from the at least one cylinder and into a tank;
directing fluid away from the at least one motor, across a back pressure element, and into a tank; and
supplying a dedicated make-up fluid supply to a valve arrangement at a location between the at least one motor and the back pressure element.

16. The method of claim 15, wherein said supplying includes directing fluid from the pressurized supply to the valve arrangement to introduce make-up fluid to the at least one motor.

17. The method of claim 16, wherein said directing fluid from the pressurized supply includes directing fluid across a combination main relief and by-pass valve.

18. The method of claim 15, wherein said supplying includes directing fluid from a pilot fluid supply to the valve arrangement to introduce make-up fluid to the at least one motor.

19. The method of claim 18, wherein said directing a pilot fluid supply includes directing fluid across a pilot relief valve.

20. The method of claim 15, wherein said supplying includes directing fluid from at least one of the pressurized supply and a pilot fluid supply to the valve arrangement to introduce make-up fluid to the at least one motor.

21. The method of claim 15, wherein said directing fluid away from the at least one cylinder includes directing fluid into the tank without passing across the back pressure element.